REMARKS

INTRODUCTION

In accordance with the foregoing, the specification and claims 4, 6 and 10 have been amended. Claims 1 and 3 have been cancelled. Claims 4-6, 8 and 10 are pending and under consideration.

OBJECTION TO THE SPECIFICATION

The specification was objected to because of informalities in paragraphs [0026], [0035], [0037], and [0041].

Regarding paragraph [0026], appropriate correction has been made to paragraph [0026] in accordance with the Examiner's suggestion.

Regarding paragraph [0035], this paragraph has been amended to clarify that FIG. 6B represents the input waveform of the voltage comparator 11 **before** a center point (upper core origin) of the upper core 4a passes a middle point (coil origin).

Regarding paragraph [0037], this paragraph has been amended to clarify that FIG. 7A through 7C are waveforms when the upper core origin **has passed** the coil origin.

Regarding paragraph [0041], this paragraph is directed to when the output V_0 of the voltage comparator 11 is at the second zero point during the compression stroke of the piston and the piston is at a top origin position and further the top origin position is also passed during an extension stroke. As noted in paragraph [0042], the position of the top dead center can be estimated based on the duration of time that passes before the output V_0 of the voltage comparator 11 passes the second zero point having a zero output in the top area twice.

The Applicant has further provided the following example how to how to estimate an exact position of the top dead center based on the teachings of the subject application. Test results as in FIGS. B and C and Table 1 may be obtained when tests are performed using a linear compressor according to the present invention under the following conditions:

As shown in FIG. A, a sensor coil 2 is disposed in a position detection sensor 40 to make the top dead center of a piston stroke in a low cooling state be the top origin.

A triangle pulse frequency is 20kHz and a piston stroke frequency is 60Hz. The maximum piston stroke is ± 8.6mm, and the top origin position, the piston stroke top dead center position in a middle cooling state and that in a high cooling state are 7.7mm, 8.0 mm and 8.3mm, respectively,

from the piston stroke center, as shown FIG. A. Here, when the piston stroke is +8.6 mm, the piston collides with a cylinder. That is, the collision point is + 8.6mm.

All the piston strokes in FIG. B appear as sine waveforms, as described in paragraph [0044] of the subject application. The waveforms A, B, C and D in FIG. B show piston strokes in the low cooling state, in the middle cooling state, in the high cooling state, and in the collision state when the piston makes a collision with the cylinder, respectively. FIG. C shows the enlarged E portion of FIG. B.

FIG. C shows the amounts of time Δt1, Δt2, Δt3, Δt4 taken when the piston passes the top origin twice and the distances d1, d2, d3, d4 from the top origin to the top dead center for each piston stroke waveform.

Table 1 shows values of the distance d from the top origin to the top dead center of the piston stroke relative to the amount of time Δt taken when the piston passes the top origin twice.

Here, a CNT Number in Table 1 refers to a count number which the triangle pulse counts during the amount of time Δt taken when the piston passes the top origin twice. The measured CNT Number corresponds to the amount of time Δt.

The amount of time Δt with respect to the A waveform for the piston stroke in the low cooling state is Δt1 and the distance therefore, is d1 as shown FIG. C. Here, Δt1 and d1 are both zero as described in Table 1 because the top dead center of the piston stroke in the low cooling state equals the top origin.

The amount of time Δt with respect to the B waveform for the piston stroke in the middle cooling state is Δt2 and the distance d is d2, as shown FIG. C. The amount of time Δt2 is 28.7 CNT Number, approximately 29 CNT Number, and the distance d2 is 313 μm, approximately 310μm(0.310mm), as described in Table 1.

The amount of time Δt with respect to the C waveform for the piston stroke in the high cooling state is Δt3 and the distance d is d3, as shown FIG. C. The amount of time Δt3 is about 41 CNT Number and the distance d2 is about 630μm (0.630mm), as described in Table 1.

The amount of time Δt4 with respect to the D waveform for the piston stroke in the collision state is approximately 49 CNT Number and the distance d4 is about 900μm (0.900mm), as shown in FIG. C and Table 1.

As described above, once a CNT Number which corresponds to the amount of time taken when the piston passes the top origin twice is measured, the distance from the top origin

to the top dead center could be estimated by using a data table like Table 1. For example, when the measured CNT Number is 25, the distance is 0.238mm, as shown in Table 1. Therefore, the top dead center of the piston stroke can be estimated as 7.938mm, which equals the top origin position (7.7mm) plus the distance (0.238mm).

Withdrawal of the foregoing objections is requested.

FIG. A

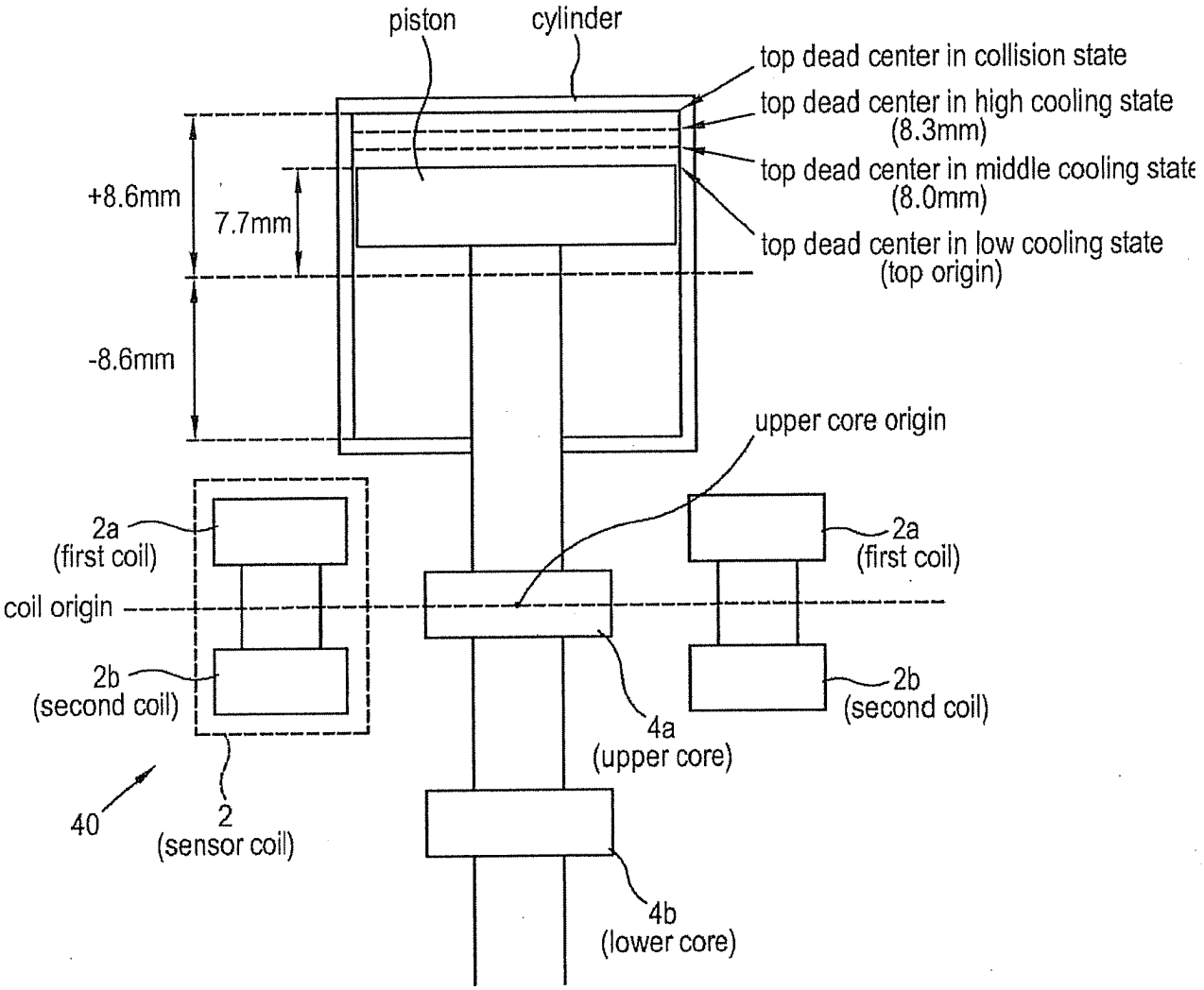


FIG. B

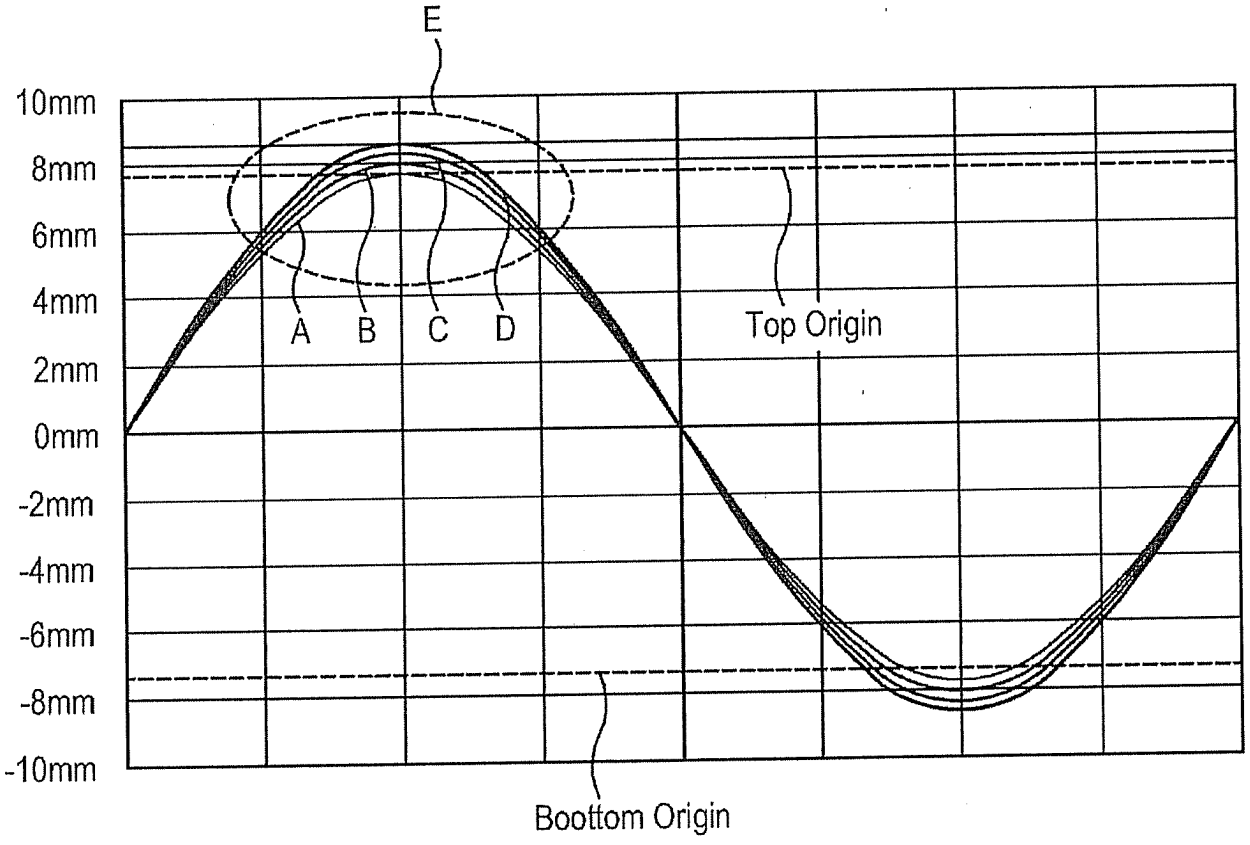
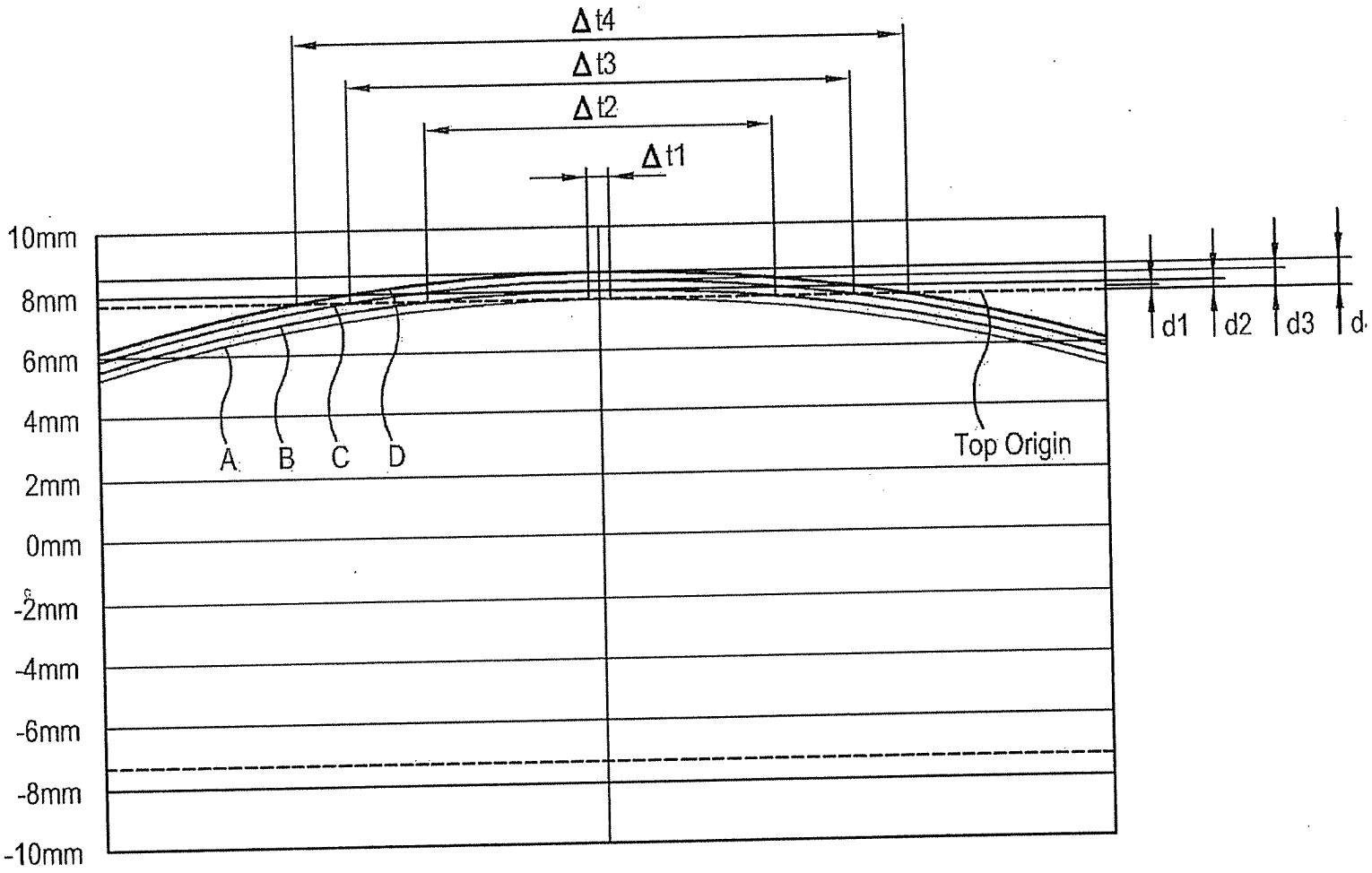

E
10mm
8mm
6mm
4mm
2mm
0mm
-2mm
-4mm
-6mm
-8mm
-10mm
A
B
C
D
Top Origin
Boottom Origin

FIG. C


Δt4
Δt3
Δt2
Δt1
10mm
8mm
6mm
4mm
2mm
0mm
-2mm
-4mm
-6mm
-8mm
-10mm
A
B
C
D
Top Origin
d1
d2
d3
d

[Table 1]

	Distance (d)	CNT Number (Δt)
Collision point	0.904 mm (d4)	49.0741 (Δt4)
	0.870 mm	48.1481
	0.838 mm	47.2222
	0.806 mm	46.2963
	0.774 mm	45.3704
	0.744 mm	44.4444
	0.713 mm	43.5185
	0.684 mm	42.5926
	0.655 mm	41.6667
High cooling state	0.626 mm (d3)	40.7407 (Δt3)
	0.598 mm	39.8148
	0.571 mm	38.8889
	0.545 mm	37.9630
	0.519 mm	37.0370
	0.493 mm	36.1111
	0.469 mm	35.1852
	0.444 mm	34.2593
	0.421 mm	33.3333
	0.398 mm	32.4074
	0.376 mm	31.4815
	0.354 mm	30.5556
	0.333 mm	29.6296
Middle cooling state	0.313 mm (d2)	28.7037 (Δt2)
	0.293 mm	27.7778
	0.274 mm	26.8519
	0.255 mm	25.9259
	0.238 mm	25 0000
	0.220 mm	24.0741
	0.204 mm	23.1481
	0.188 mm	22.2222
	0.173 mm	21.2963
	0.158 mm	20.3704
	0.144 mm	19.4444
	0.131 mm	18.5185
	0.118 mm	17.5926
	0.106 mm	16.6667
	0.094 mm	15.7407
	0.084 mm	14.8148
	0.074 mm	13.8889
	0.064 mm	12.9630
	0.055 mm	12.0370
	0.047 mm	11.1111
	0.040 mm	10.1852
	0.033 mm	9.2593
	0.027 mm	8.3333
	0.021 mm	7.4074
	0.016 mm	6.4815
	0.012 mm	5.5556
	0.008 mm	4.6296
	0.005 mm	3.7037
	0.03 mm	2.7778
	0.001 mm	1.8519

CLAIM REJECTIONS – 112, first paragraph

Claims 6, 8 and 10 were rejected under 35 USC 112, first paragraph, as failing to comply with the enablement requirement. Specifically, the Examiner noted that these claims recite a controller which finds a top dead center of a piston. It is respectfully submitted that the explanation given above overcomes the enablement rejection under 35 USC 112, first paragraph.

Specifically, detecting an offset value indicating the degree a center point of reciprocation movement of the piston is off from a predetermined center point by measuring a difference of time that a center point of the upper core takes to pass a coil origin positioned at a middle point between the first sensor coil and the second sensor coil recites detecting an offset value using a difference of time, which is discussed in paragraphs [0044] and [0045] of the specification.

Withdrawal of the foregoing rejection is requested.

CLAIM REJECTIONS – 112, second paragraph

Claims 1, 3-6, 8 and 10 were rejected under 35 USC 112, second paragraph, as being indefinite. Appropriate correction has been made to the claims changing "series" to "parallel" in accordance with the Examiner's suggestion.

Withdrawal of the foregoing rejection is requested.

CLAIM REJECTIONS -- 101

Claims 1, 3-6, 8 and 10 were rejected under 35 USC 101 because the claimed invention lacks patentable utility.

It is respectfully submitted that the explanations give above clarify the specification of the present application as originally filed so that it is clear that the claims of the present invention have patentable utility. Specifically, the recited controller detects an offset value indicating the degree a center point of reciprocation movement of the piston is off from a predetermined center point by measuring a difference of time that a center point of the upper core takes to pass a coil origin positioned at a middle point between the first sensor coil and the second sensor coil, and by measuring an elapsed time that a center point of the lower core takes to pass the coil origin according to the reciprocal movement of the piston.

Withdrawal of the foregoing rejection is requested.

CLAIM REJECTIONS – 102

Claims 1 and 3 were rejected under 35 USC 102(b) as being anticipated by Shimizu et al. (US 4,804,913).

Claims 1 and 3

Claims 1 and 3 have been cancelled.

CONCLUSION

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

STAAS & HALSEY LLP

Date: January 3, 2008

By: Gregory W. Harper
Gregory W. Harper
Registration No. 55,248

1201 New York Avenue, NW, 7th Floor
Washington, D.C. 20005
Telephone: (202) 434-1500
Facsimile: (202) 434-1501